MSc Report

Risks in Transportation Megaprojects in India

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Abstract

Despite the growing dominance of megaprojects in the world, they suffer from paradoxical shortcomings, in terms of benefit shortfalls and cost overruns. This has largely been attributed to the fact that they are a different 'breed' of projects and therefore need to be planned and implemented differently.

Due to it growing economy, India too is seeing a rise in the number of megaprojects. Owing to the weak financial background of India, it is essential to ensure that not only are its limited resources are invested in the 'right' project (giving maximum benefit to maximum people) but also that the project is implemented in the 'right' manner.

It thus follows that understanding the factors that influence the implementation of a megaproject, especially in the Indian context becomes pertinent. Recently the Delhi Metro, a megaproject which gained much public support, has come into the limelight due to its successful delivery.

This research therefore undertakes a journey into the field of megaprojects in India. It attempts to take into account views, both of the literary experts and the practicing professionals of this field, and also of some of the key players of the Delhi Metro project. It aims to specifically identify the main areas of concern and based on its findings, expects to come up with a list of recommendations for future such projects in India.

Key words: Indian economy, infrastructure, megaprojects, Delhi Metro, client, risks.

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List of Abbreviations/ Terminologies Used

DMRC	Delhi Metro Rail Corporation (Client)
GC	General Consultants to the DMRC (Project Managers)
GOI	Government of India
KSHI JV	Consortia of international contractors
MRTS	Mass Rapid Transit System
PSU	Public Sector Undertaking
PPP	Public Private Partnership
PPE	Personal Protection Equipment
Delhiites	Residents of Delhi
State /local government	Government of Delhi
Central Government	Government of India

1.0 Introduction

1.1 Prelude

Indian economy has been booming in the recent years and the Indian government is recognising the need for appropriate and modern infrastructure to sustain and promote this growth. The Government of India (GOI) is also investing in many new infrastructural megaprojects in India. These projects however, have not performed successfully in the past. They have been dogged by political interference, corruption, optimism bias, lack of regulation and often have overrun their budgeted cost and time. The size and complexity of these projects is also growing and this thus warrants a research into the factors and issues influencing them.

The objective of this report is thus to understand the functioning of megaprojects and the issues faced by them with specific attention to the transport projects of India. It aims to arrive at a set of recommendations for the successful implementation of such complex projects in the Indian transport sector. It also hopes to be the basis for further study into the less researched area of MRTS (Mass Rapid Transit System) & megaprojects in India.

This research attempts not only to increase the understanding of Indian megaprojects for the citizens of India but also for the international contractors looking to work in India.

1.2 Overview of the Report

Following this initial Chapter of introduction, Chapter 2 provides the background of the infrastructure sector in India, explaining the various factors responsible for the present scenario.

In order to understand the concept of Megaprojects, it becomes essential to have the appropriate literary knowledge and support. This is attempted in Chapter 3, where after the literature review, a theoretical framework is provided to support the research.

Chapter 4 sets out the research methodology of the report and states the question for the research while Chapter 5 presents the analysis of the research interviews and attempts to relate the findings of the research to the theoretical framework. Chapter 6 concludes the report with a summary of the key issues emanating from this study and ends with a series of recommendations for future such projects.

2.0 Context

2.1 Background

In the recent years Indian economy has become one of the fastest growing in the world. This growth can broadly be attributed to two reasons, the first being regular and abundant monsoon and second being India's programmes of reforms, which applied since 1991, have brought about increased competition and efficiency (Thomsen, 2007). Increase in the population and especially of the middle class (which is fuelling domestic consumption), coupled with increase in India's young population (who are both educated and aware) are also considered to be important factors influencing this growth (Acharya, 2007).

According to Goldman Sachs India could overtake Britain and have the world's fifth largest economy within a decade and if the growth continues it could surpass the economy of the US and become second only to that of China. India could become the second largest economy in the world, as early as the middle of century (Grammaticas, 2007).

The Indian economy is changing from being an agrarian one to an industrial one. A decade of reforms have opened the country to greater competition, and spurred industries to become more efficient. Everywhere in India's cities are signs of economic boom. This is thought to be the start of a transformation that will reshape the global economy (Grammaticas, 2007) as India will become one of the most powerful economies in the world.

According to Wilkinson (2006) infrastructure hasn't kept pace with the growth and has become a hindrance. Though the government would like to push the growth rates even higher to match that of China, the economy is being held back due to the lack of modern and efficient infrastructure. Due to years of under-investment and over-use, the state of India's infrastructure is deplorable. Sizable investment will be necessary to sustain just the current growth rates. In addition to investment, further reforms and an alternative approach to executing programmes would be necessary to create the kind of infrastructure required to facilitate the targeted growth (Thomsen, 2007).

'India's infrastructural needs are clearly enormous and have been recognised by international investors, Indian business organisations and many politicians as being one of the primary obstacles to the country's future economic growth' (Ahluwalia, as in Wilkinson, 2006).

The Indian government is aware of these deficiencies. In order to overcome it, the GOI has estimated that at least $320bn will require to be spent on its infrastructure alone in the next five years (Thomsen, 2007), with the real figure possible being higher than that. The fact that Prime Minister Manmohan Singh is personally monitoring all the major infrastructure projects shows the seriousness of GOI towards these projects.

2.2 Infrastructure in India

The Government of India (GOI) is facing several problems which are holding back the development programmes. First there is the simple resource crunch. The central government is running huge deficits, more than 85% of which stem from the very large subsidies on various goods, most of which are non-merit goods. The states of India are in an even worse fiscal shape (many of which are only just meeting their current expenditures, let alone investing for the future in infrastructure) by borrowing from provident funds, taking loans through their state owned enterprises or delaying payments to creditors (Thomsen, 2007 & Wilkinson, 2006).

But even more serious is that much of the money that is being spent on infrastructure seems to be going waste with spending spread amongst too many small projects, no return in state investment in infrastructure and very poor quality construction and maintenance. Many of these projects are over budget and of sub-standard quality (Thomsen, 2007 & Wilkinson, 2006).

The project implementations in India also suffer from the under-estimation of cost and over-estimation of benefits to show higher internal rates of return and benefit-cost ratios. This issue gets further compounded by inappropriate organisational processes and the lack of skills resulting in cost overruns in excess of 60% (Morris, 2001).

2.3 Politics and Infrastructure

The reasons for the above are complex and India's high overall levels of corruption are partly responsible. Even in projects with international competitive bidding, the actual execution of most of these works is sub-contracted to petty contractors incapable of executing such big projects. Most recipients of these small grants have to pay bribes to the local officials or politicians in order to be selected by them as beneficiaries. This is clearly one of the major causes of poor performance of infrastructure projects (Wilkinson, 2006).

Furthermore, the corruption in these infrastructural projects often has political roots. These projects which generate kick-backs are one of the main means through which the incumbent politicians and parties can raise money and pay-off party supporters. In order to starve opposition parties of resources, the legal means of raising the much needed party funds have gradually been closed-off by those in office (Thomsen, 2007 & Wilkinson, 2006).

Due to political interference much of the infrastructural spending, especially within the states of India, is distributed in a clientelistic manner with the primary aim of securing political support and votes. Most of the politicians use their discretionary powers to provide infrastructure to their political clients and deny infrastructure to their opponents. The political competition in India affects the infrastructure spending in two ways. First it increases the supply of infrastructure expenditure as politicians announce new programmes and spending in order to win votes. And second, it reduces the quality of infrastructure as money is siphoned off kickbacks and transferred to finance political campaigns and channel money to supporters. (Wilkinson, 2006)

Politics has influence not only over where the infrastructure gets built and who obtains employment in state-owned enterprises but also over the pricing of the end product. These pricing policies are at the root of many of the problems in Indian infrastructure. Often billed as pro-poor subsidies, they generally are aimed at those who can bring in the votes (Thomsen, 2007).

However, the growing prosperity has, for at least some of the population, created a sizable and growing constituency for political reforms. There is a new level of concern and information about the extent of political patronage and corruption, spread by a rapidly expanding mass media which has helped create wider knowledge and concern about the local patronage. There is an increasing awareness amongst the public about corruption in public life and also about the focus on more performance oriented policies. (Wilkinson, 2006)

Whilst there are severe shortages of infrastructure in India, a significant part of the existing is underused or even unused due to over-provision or misdirected resource allocation. In the end, it is the tax-payers who lose out and who in fact should have benefited the most by its growth. (Morris, 2001)

2.4 Public Sector Undertakings (PSU)

After independence, the GOI set up PSUs to build and manage the infrastructural and industrial needs of the country. These PSUs are run by civil servants/bureaucrats from the Indian Administrative Services (IAS), a successor to the Indian Civil Services (ICS). Over the years the PSU's have turned into white elephants characterized by complacency, inefficiency and red-tapism. Due to continuous political interference, the central and the state governments of India have not allowed the managers of these public enterprises/ projects to operate their organisations in a commercially orientated manner. (Morris, 2001)

Another reason for the inefficiency of the PSUs is the fact that the future of the employees and managers of these organisations are not linked to the future of the organisations. The managers are generally part of a cadre with career paths and salaries almost entirely independent of the performance of the organisations they manage. (Morris, 2001)

Another peculiarity of the Indian PSUs is the vigilance anti-corruption unit, created by the GOI to root out corruption. The purpose of this unit is to monitor and investigate any signs of corruption on projects. Strong actions including delayed promotions are not only taken against those found guilty but also those under

investigation. This therefore forces the workers to abide strictly by the written rule, often circumventing common sense and therefore leading to delays on projects (Mahalingam, 2005). The fear of vigilance also leads to the workers drawing up one-sided contract in favour of the government rather than the contractor. The notion that in a contract, both parties can mutually (and legally) benefit is not understood. Despite being one-sided, the contractors still take these contracts up. The knowledge that they have the option to cheat and/or under-perform during the course of the project allows them to do so (Morris, 2001).

2.5 Indian Construction Industry

The Indian construction industry is characterised by very poor health, safety and quality standards. The contractors and workers regularly flout safety regulations and work without appropriate safety equipments. This primarily is due to the fact that the cost of replacing an injured worker is viewed as relatively low due to the existence of a large labour pool and also that safety consciousness/education amongst the workers is generally very poor. The construction companies/contractors further take advantage of the fact that there are no safety legislations and therefore they are not bound by law to enforce them. Even if a contract specifically requires health and safety measures to be enforced, the contractor chooses to ignore them (Mahalingam, 2005).

2.6 Infrastructure Project Failures

There are many examples of in-efficient or unsuccessful government initiated projects. The implications of such projects, to a country with limited resources such as India, are indeed lamentable. Two of such projects have been discussed here.

Kolkatta metro

The Kolkatta metro railway is the first underground railway project to be implemented in India. The construction of the 16.5 km long stretch started in 1972 and was completed in 1995 (www.kolmetro.com/) and constantly was plagued by safety concerns, stifling traffic tie-ups and other delays (Siemiatycki, 2006). This resulted in the project cost over-running 10 times the original estimate and construction period stretching over 23 years. The system which was originally

estimated to be constructed at a cost of £17.5 million was actually completed at a cost of £200 million. Even more frustrating was the fact that there was a major shortfall in the actual ridership. The ridership estimated for 1990 was 612.5 million whereas the actual was 55.8 million, a dismal 9% of the projected figure (Advani & Tiwari, 2005).

Sardar Sarovar Dam

This is another classic example of a government initiated project over-running its budget and estimated time and with benefit shortfalls (Flyvbjerg, 2005). Initiated in 1946, the construction began in 1961 and even after 46 years is not complete. With no clear benefits, poor environmental and relocation strategy, fluid design still to be finalised, the Sardar Sarovar Dam has been called India's greatest planned human and environmental disaster by its opponents (Wood, 1993). It has constantly faced opposition from environmental groups. In 1986-87 the project cost estimated for its completion was £0.84 billion and later became £1.64 billion at 1991-92 prices whereas its actual expenditure incurred till date is £2.65 billion.

2.7 The Delhi Metro Phase-I

In this respect, the recently completed Delhi Metro phase-I project is a successful example of a public initiated project which negates the general understanding of such projects in India. The Delhi Metro is being hailed as a political, managerial and engineering triumph. The system opened within budget and on time- a rarity in Indian public works projects (Rohde, 2003).

Delhi Metro Train: Source: DMRC

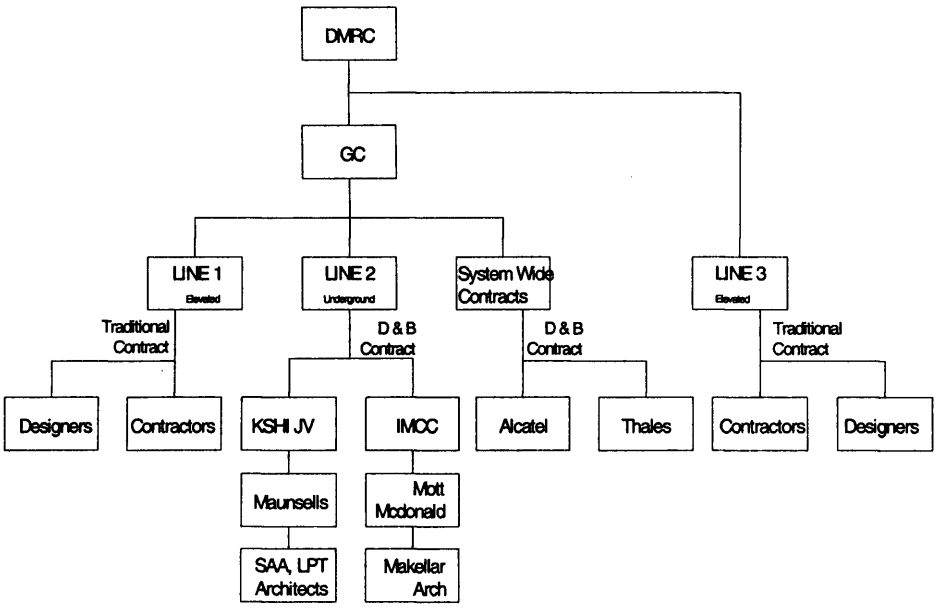
The Delhi Metro successfully managed to involve the public. When a section of the phase-I of the Delhi Metro opened in 2002, 'hundreds of thousands of people took what they called joy rides, short trips to savour the efficiency, modernity and sense of progress the new system seems to generate' (Rohde, 2003).

Conceived in 1971, the construction began in 1998 and the 65 km long phase-I was completed in 2006- within budget and before time, an achievement in itself. The first phase comprised of 3 lines and 59 stations with a combination of underground, at-grade and over-ground sections on a broad gauge system. The rolling-stock was imported from Korea and Japan for the project (DMRC, 2007).

In 1996 the project cost was estimated to be £ 750 million and was revised in 1998 (beginning of construction) to £ 1.31 billion. The project was finally completed in 2006 at a cost of £ 1.32 billion (DMRC). The project was estimated to be completed in 10 years and was actually completed in 7 years (Delhi Government, DMRC). The estimated daily ridership for the project was 2.3 million and was twice revised down to 1.15 million (1998) while the achieved is 0.6 million (DMRC, 2007).

The project was financed through a combination of international and local funding sources; 64% of the project cost was provided by state sponsored Japanese Bank of International Corporation (JBIC); 28% of the project cost was financed through equal equity contributions from the Central and Delhi State governments; both governments also financed a further 5% through an interest free loan to cover the cost of land acquisition; and final 3% were raised through property development (Siemiatycki, 2006).

The Government of India and the Government of National Capital Territory of Delhi, in equal partnership set up a company called the Delhi Metro Rail Corporation Ltd (DMRC) for the design, construction and operation of the Delhi Metro. Government officials were mainly seconded from the Indian Railways to the DMRC offices for the project and were hand-picked by the Managing Director (MD) of the DMRC.



DMRC Phase1 Structure

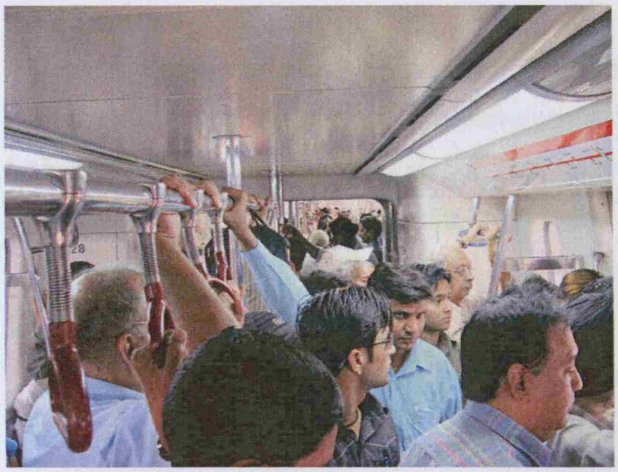
The DMRC in turn hired a group of project managers, called the General Consultants to the DMRC (GC), a joint venture comprising of multiple international companies (PCI, PBI, Tonichi, JARTS, RITES) for the phase-I of the project. The contract itself consisted of one underground line and two over ground lines, with the design and build contract of the more complex underground line being split amongst two main international contractors, KSHI-JV (a joint venture between Kumagai, Skanska, HCC, Itochu) and IMCC (a joint venture between Dywidag-L&T-Samsung-Ircon-Shimizu). The system-wide works like signalling, telecommunications, automated fare collections, traction, were awarded as design and build contracts to international consortia. The two over ground lines, planned on the conventional means of construction were awarded the traditional contracts.

Source: DMRC

The project was planned as a technology exchange, in which international firms with expertise in the development of metro railways were contracted in order to aid with various tasks such as general planning, station design, construction management, rolling stock production, etc. These international firms, from countries such as Japan, Germany, Sweden, Korea, France and the US, were required to partner and transfer their expertise to Indian firms, so that indigenous companies could take a lead role in the later stages of the Delhi Metro as well as metro projects in other cities of India (Siemiatycki, 2006).

Much of the credit for the project's success goes to Elattuvalapil Sreedharan, the MD of the project. The 75-year-old long time public servant, a qualified engineer has been hailed for maintaining zero tolerance for corruption and for innovative solutions to problems (Rohde, 2003).

Instead of creating a bulky bureaucracy, he subcontracted most of the construction work, hiring top Indian and foreign engineering firms. Of the 20,000 workers involved in the project, only 400 are government employees. Majority of the work was engineered to be carried out with minimum disturbance to the public. Health and safety were key concerns and the four and a half years of construction resulted in the death of eight which is considered a measure of success (Rohde, 2003).



Source: DMRC

The success of the Delhi Metro has also been attributed to its excellent public relation strategy and the careful cultivation of its image as a company which cares about the community. This was implemented in a number of ways. On realising the fact that most Delhiites (residents of Delhi) had personally never experienced a metro, the DMRC made the effort of undertaking numerous awareness campaigns through distribution of leaftets, advertisements, street plays, etc. Its caring image was further reinforced when it equipped the stations with special lifts, ramps, Braille signs, tactile flooring in order to encourage the disabled to their systems. The efficient manner in which vehicular and pedestrian traffic was managed, signs were posted announcing the works, on seeing construction workers wear appropriate PPE (personal protection equipment), washing the tyres of the vehicles exiting the site, all led the Delhites to appreciate the caring nature of the company (Siemiatycki, 2006). The fact that the Delhi Metro has neither been vandalised nor been dirtied by the public, goes to show the immense pride the public of Delhi feel towards it. It is its measure of success.

Due to the success of the Delhi Metro and taking confidence from it, the Indian government has decided to grant approval for the construction of the second phase of the Delhi metro comprising of 79 stations over 121 km long route planned to be completed by the year 2010, as well as proposing MRTS projects in the cities of Bangalore, Mumbai, Hyderabad, Kolkata, Pune, Cochin.

2.8 Lessons to be Learnt

There are many valuable lessons to be learnt from the Delhi Metro project and this thus warrants a research on it. It therefore is taken as the basis for this particular study. Also, if the success of the Delhi Metro is to be repeated in the other proposed similar projects in India, then these lessons of the Delhi Metro become especially significant.

3.0 Literature Review

3.1 Foreword

Before initiating research into the Delhi Metro, it is essential to review similar projects theoretically and to understand their performance within India. However, due to the lack of literature available on the megaprojects of India and of adequately documented examples of megaprojects within India, review of international literature has been undertaken. This section therefore examines the thinking of experts in the field of management of megaprojects, its key areas of concern and into the recommended route for the delivery of a successful megaproject; it maintains a special focus on transport projects.

3.2 Megaprojects

Capka, 2004

The economy of the world is booming and technology is thought to have a major role to play in it. There is a never seen before need to shrink space and increase communication. Some sociologists talk about the 'end of geography', while others talk of 'death of distance', while Bill Gates talks about 'frictionless capitalism'.

Together these signify a different stage of social and economic development. Infrastructure and technology have become synonymous. Infrastructure has moved from being a simple pre-condition for production and consumption to being the core of activities. It is a great space shrinker. Today it plays a key role in the creation of a new order where people, goods, energy, information and money move about with unprecedented ease. Modern humans are constantly eliminating distance by building more and improved infrastructure for transport, including telecommunications and energy (Flyvbjerg, 2003a).

To aid this growth and development, bigger and more complex projects are being commissioned. Typically costing over $1billion, this has resulted in the creation of a new breed of infrastructural projects- the 'megaprojects' (Capka, 2004). Be it dams, air, rail, tunnels, with the ever growing and expanding economy of the world, there is a corresponding but exponential growth of these projects. These projects can be quite powerful and can fuel an economic boom in their urban setting as in the case of the Guggenheim Museum, Bilbao (Flyvbjerg, 2005a).
There is, however a paradox here. Even though the number of the megaprojects is rising, their efficiency and performance in terms of economy, environment and public support, is not. This poor performance is also consistent through out the world and not restricted to either developed or developing countries. Notorious examples include the Britain-France Channel tunnel, the Sweden-Denmark Oresund bridge, Boston's Big dig, etc. Most megaprojects go above budget and are not completed within the expected time and do not provide the expected benefits. This is not a recent phenomenon Wachs, (according to Flyvbjerg) over 20 years ago in 1986 said that "forecasted patronage is always apparently higher than actual patronage, while forecasted costs always seem to be lower than actual costs" (Flyvbjerg, 2006) This problem is compounded in the transportation sector projects, where the expected ridership is also not achieved (Flyvbjerg, 2003b).

A transportation infrastructure projects study conducted by Flyvberg (2006) found that:

- 9 out of 10 projects have cost overrun.
- Overrun is found in the 20 nations and 5 continents covered by the study.

- Overrun is constant for the 70-year period covered by the study; estimates have not improved over time.

The study further found that

- 84% of rail passenger forecasts are wrong by more than ± 20.
- 9 out of 10 rail projects have overestimated traffic.
- This inaccuracy was found to be constant over the 30-year period covered by the study; forecasts had not improved over time.

Combining the data in the above tables, Flyvbjerg saw that for rail, cost overruns of 44.7% combine with an average traffic shortfall of 51.4%.

Cost overruns and benefits shortfalls in turn have further negative implications to the project. According to Flyvbjerg (2005b):

1. They lead to delays, further cost overruns and benefit shortfalls- this is so as securing additional funds to cover the cost overruns often takes time, projects may need to be re-negotiated or re-approved which takes time. As many megaprojects are loan-financed and have long construction periods, they are especially sensitive to delays as these result in increased debt, increased interest payments and longer payback periods.
2. They destabilize policy, planning, implementation and operations of projects.
3. The problem is getting bigger because projects are getting bigger- some megaprojects are so big that they can affect the economy of a country and also adversely affect the credit rating. g the billion dollar cost overrun of the 2004 Athens Olympics affected the credit rating of Greece.
4. Inferior projects get implemented, leading to Pareto-inefficiency and as a result, the country as well as the other deserving projects, lose out.

There is a shortage of resources in every country and they should not be wasted anywhere, be it a developing or a developed country. In order to ensure the proper utilisation of a country's resources and to efficiently implement these projects in

the future, it becomes essential to understand the reasons for the poor performance of these projects in the past.

3.3 Survival of the Unfittest, Accountability and Risks

In attempting to understand the shortcomings of megaprojects, Flyvbjerg (2003) rules out technological reason (ie. due to faulty estimates, etc) as a possible cause for their failure arguing that these would have improved with modern techniques and better models over time.

A possible cause identified by Flyvbjerg is 'optimism bias' where the planners and project promoters make decisions based on delusional optimism rather than on rational reasoning of viability (Flyvbjerg, 2006).

However, according to Flyvbjerg (2003 & 2006), Wachs (1990), Morris (2001), the main cause for cost overrun and benefit shortfall is due to the 'strategic misrepresentation' (ie lying) by planners and project promoters. Cities, politicians, planners compete intensely for scarce national funds to aid their project and they present their project in a positive manner (often neglecting its shortcomings) in order to beat competition. They thus deliberately misrepresent costs, benefits and risks of their project in order to increase the likelihood of their project (and not their competitors) winning funding.

Underestimated costs + Overestimated benefits = Project approval

Showing the project at its best ensures project approval, but results in what is called as inverted Darwinism ie survival of the unfittest. It is not the best project which gets implemented or which gets funding but the project which looks best on paper (Flyvbjerg, 2006).

These problems are further compounded by the lack of accountability. Minister/politicians strategically misrepresent facts or execute unfeasible projects, while taking comfort in the fact that, they would not be in office when the project

actually gets built or is completed (due to the lengthy time periods involved in these projects).

Furthermore, Flyvbjerg (2003) suggests that risks and uncertainties are inherent to all projects and should be at the heart of any decision making. These are however, often ignored. He further suggests that financial, environmental and safety risks cannot be eliminated from megaprojects, but they can be acknowledged and reduced through their careful identification and allocation to those best suited to carry them.

3.4 Megaprojects- They are a Different Breed

In order to understand megaprojects, Capka (2004) argues that they should not be viewed as simply more expensive versions of normal infrastructure projects- they are a different breed. If success is to be achieved, planning for a megaproject must be different to a traditional project- diverse interests must be synchronized; communication should happen effectively and focus must be maintained on the 'bigger picture'. There is a requirement to manage numerous, simultaneous and complex activities while maintaining tough schedules and tight budgets and they thus are unique. An understanding of the dynamics of megaprojects will help project managers and planners foresee and account for challenges in the management preparation process.

According to Capka (2004), some characteristics which define megaprojects are:

- Size

Megaprojects are huge undertakings with big impacts on human, physical and economic environments and they thus attract public attention and involvement. They are so large that they create their own economic environments, during construction fuel a local economic boom and may weaken the economy of the region after construction is completed. These can also tax the construction capacity of a region, affecting the bidding climate and cost of other projects.

- Complexity

Megaprojects are technically complex projects requiring superior engineering and construction techniques. As they combine both the private and the public sector, appropriate and effective management skills are also required. Multiple stakeholders are involved in such projects, each having varied/conflicting interests. Maintaining their cooperation and much needed support through out the project life becomes a complex challenge. According to Flyvbjerg (2006) megaprojects typically also involve two or more political or governing jurisdictions (with conflicting interests) thus further complicating the decision making process.

- Complex Procurement

Megaprojects require innovative fashioning of contracts. The large size of the project limits the number of contractors who bid for the project and in turn create a poor bidding climate. In order to meet the cost and time schedules, construction precedes design completion in most cases. Due to the complexity more than one contractor is involved. The risks arising from this thus need to be accepted and managed by the owner before the start of the project.

- Controversy

An undertaking which is of a public nature and requires vast amount of resources is bound to create controversy. Megaprojects tend to become targets for political, environmental and public debate.

- Time

Due to their inherent complexity and nature, megaprojects often have long time schedules. The public's patience and aspiration, political and economic policies, technology, etc. are all bound to change within this time period and it becomes crucial to effectively manage or address this change. Flyvbjerg (2006) also advises the same.

- Scope Creep

Due to the size and the time period involved, megaprojects become easy targets for scope change. There is a notion that due to the size of the project as well as

their perceived money-rich image, megaprojects can absorb any additional scope. Flyvbjerg (2006) suggests that such unplanned events are often unaccounted for, leaving budget and other contingencies sorely inadequate.

- Urban Setting

A large number of megaprojects are designed for urban areas. Minimum disruption to the urban scenario, safety of the residents while maintaining schedule and quality commitments becomes important. Management of the urban area becomes especially important due to the long time frames involved.

- Risk and Uncertainty

Risk and uncertainty are inherent to any project and become manifold in project of such complexity. Their effective assessment and management becomes crucial for megaprojects as expecting 'all to go as originally planned' is not realistic given the complexity of these projects.

According to other authors, some of the other shortcomings of a complex projects are:

Adversarial Relationships

According to Chan et al (2004) the construction industry is beset with several problems such as lack of cooperation, limited trust and ineffective communication leading to an adversarial relationship amongst all the project stakeholders. This type of relationship is reflected in project delays, difficulty in resolving claims, cost overruns, litigation and a win-lose climate. These get further amplified in a megaproject scenario due to its mega status.

Motivation and Innovation

Liu, et al (2002) argue that these large organisations with bureaucratic set-ups lead to powerlessness amongst its workers, which in turn creates low-esteem and low responsibility amongst them.

Complex projects present a unique challenge requiring innovative solutions. From a study carried out by Nam & Tatum (1995) they found that a project, whose leader had a high degree of involvement in it, had more innovation as the ones which did not.

3.5 Cultural Differences

Furthermore, Mahalingam (2005 A) after his extensive studies on the Delhi Metro and a rail project inTaiwan advises that megaprojects generally involve cross-national activity and multiple international contractors and experts working together. With the opening up of the markets, many governments, especially in the developing countries are soliciting international aid in terms of finance, technology, etc to speed up their respective developments. But these developments and also the people working on them, generally encounter peculiar problems and differences generated by conflicts in culture and Mahalingam (2005b) refers to these as 'cultural differences'. Some of the differences he found on the Delhi Metro are:

- Conflicts regarding administration of the works.

This occurred due to the client's inability to understand the procurement route of 'design and build' which was followed for a section of the project. This was a new route for the Indian public sector employees who held the belief that the contractor always cheats and thus did not allow the contractor any deviation from the design or the contract and interfered in the contractor's works. The project initially lacked trust between the client and the contractor which lead to delays.

- Conflicts regarding the degree of conformance of the works to the contract specifications.

The clients' organisation was staffed by civil servants who, due to the fear of the vigilance, initially insisted on a bureaucratic, inflexible and rule following approach to running the project which, to the frustration of the international contractors, led to long delays.

- Conflicts due to differing perceptions in safety and quality standards.

These were caused due to the fact that the local labourers were neither accustomed to nor educated about following safety and quality standards, as demanded by the international contractors.

House, et al (2002) additionally suggest that impact of culture on leadership is quite important. Leaderships and organisational theories should transcend cultures to understand what works and what doesn't in different cultural settings. Adequate focus on cross-cultural issues should be maintained.

3.6 Theoretical Framework

It is thus seen that megaprojects are complex projects with large budgets and long time frames. They also have their own peculiarities and problems and as a result their implementation and delivery in many cases is not successful. However, researchers and practioners believe that by adequate risk assessment, management and understanding and also by learning from the failures of the past, these megaprojects can deliver all their benefits and within the time frame and cost approved. The key factors are summarised below:

Project Feasibility

Flyvbjerg (2003) suggests that to increase efficiency in megaprojects, risk and accountability should be placed centrally to the decision making process. The proposal should employ the data and the figures provided by project promoter with a certain degree of caution, and after taking the variuos risks into account. Optimism bias & strategic misrepresentation does exist and in order to overcome it, projects should be planned as a 'most likely development' scenario or the 'worst case scenario' rather than the 'best case scenario'.

Flyvbjerg (2003) also advises that the government cannot be the project promoter and the guardian of public interest without having a conflict of interests. Government should only play the role of formulation and auditing of public interest

objectives and should shift the financial risks to the private sector. To ensure accountability, Flyvbjerg (2003) also proposes the following:

- Transparency in the project and involvement of the public.
- Performance specifications ensuring a goal driven approach rather than a technical approach.
- Involvement of private finance without sovereign guarantee to ensure higher degree of involvement of the private financers in the design, construction and operation of the project. This would lead to better cost control against construction and operation delays.

Project Planning

According to Capka (2004b), a well conceived project management plan, which spans the entire length of a project, is vital to ensure that a quality product is safely delivered on time and within budget and which meets the expectations of all its stakeholders. In order to achieve this he suggests the following:

- Adequate cash flow and a comprehensive financial plan

Drawing up a comprehensive financial plan for a megaproject is often complicated and requires special skills particularly as funding is often varied and is sourced from both the public and the private sector, each having special restrictions on their use.

Accurate estimate is also vital. This is especially so as it is against this that the success of the project is measured by all (Sinnette, 2004b). In order to achieve this all risks need to be assessed properly. This in turn demands enough and accurate information be available before the start of the project. This is particularly important with respect to scope creep. To further assess the project an independent review should also be sought.

Sinnette (2004b) also advises that by analysing project risks and using appropriate contingencies an initial estimate should be created that will not change significantly through out the project's life.

- Funding

Government funding is scarce and sporadic. As a result, agencies are looking beyond government funding towards private or joint venture funding which ensures upfront and timely funding. As a result compared to the traditional pay as you go projects, the project can be completed sooner. This in turn leads to lower costs due to inflation savings and the public realises safety and economic benefits, sooner. Involvement of the private sector shifts the risks involved from the tax payer to the private capital markets and large global companies. The private teams have to keep the cost within what they can finance based on the project revenues. Therefore they have stronger incentives to resist the increases in project scope that make the project more costly.

A different management system is needed to manage these public private partnerships (PPP) as it is essentially a different set-up with different equation. To manage PPP a new set of skills need to be developed by the promoters of these megaprojects.

- Procurement Strategy

Unconventional procurement routes should be explored to find one which would be the most suitable to the project. The size of the project, the capabilities of the owner, the time frame, the clarity of scope of works and risk allocations all determine the preferred or recommended procurement route. The adopted procurement route in the end could be a combination of different types of contracts, thus further complicating the project. Contract interfaces become important in this situation (Yakowenko, 2004 and Capka, 2004b).

- Risk Management Strategy

The presence of risk is inherent in any project. However, due to the complexity, large time frames and the amount of money involved in megaprojects, the risks and their chances of occurring get amplified. Transportation construction projects are usually susceptible to the risks of cost overruns, scope and schedule creep,

waste, fraud, abuse, environmental, quality and safety factors. Though risk cannot be eliminated, it can be mitigated to a certain degree by monitoring a project's risk, developing strategies to mitigate them and by establishing contingency plans. Risk assessment should also be at the heart of all decision making (Flyvbjerg 2007, Winch, 2002, Allen, 2004, Capka, 2004).

- Organisation Set Up

The project management plan should provide a clear description of the project management team's composition and organisation and how it intends to conduct business. Roles and responsibilities should clearly be set out. The plan should also describe how best to integrate the private sector participant's skills into the public sector's management of the organisation (Capka, 2004b).

The size of the organisation also has an important role to play in megaprojects. According to Nam and Tatum (1995), smaller organisations facilitate the right conditions to promote innovation. They also found that a technical leader facilitates innovation as he has a high level of understanding of the technical issues. The leaders of small organisation also tend to be more involved in its running, further leading to innovation. Liu et al (2002) further suggest that small organisations also facilitate the empowerment of the workers which motivates them to perform better.

- Stakeholder and Public Trust and Confidence

Megaprojects are highly visible and inherently risky, require significant investment, take a number of years to complete and often attract regional and at times national attention. They also generate high expectations from the public. The management plan therefore needs to provide clear project objective and strategy to achieve public trust and confidence. This involves clear, unambiguous and effective communications (Capka, 2004b).

Managing expectations is critical to developing and managing the public's trust and confidence in the ability of the project delivery team to deliver a megaproject. It is important to listen and involve stakeholders affected by the project right from the beginning of a project. This helps them acquire the feeling of 'ownership' of the

project. Not involving them alienates them from the project and leads to mistrust (Sorel, 2004). According to Sinnette (2004b) public trust can be gained by providing accurate cost estimates and schedules, involving the community and effective communications.

- Autonomy of the Organisation

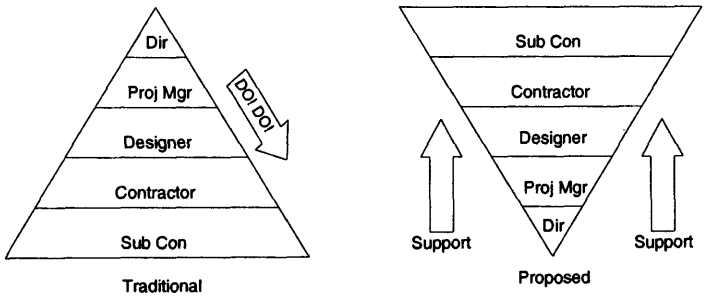
In his studies Morris (2001) found that there are a few PSUs which have performed well in the Indian context and they have a few commonalities. First is that their leaders had a greater degree of operational autonomy and that they managed to keep the dysfunctional political interference out of their organisation. The strength emanating from their organisation's good performance has given more power to their leaders and which in turn helped successfully keep the politicians away.

- Providing Continuity

The key players, environment surrounding the project and public priorities might change several times during the development of the megaproject. However, the project must be managed with a consistent philosophy and set of rules without which inefficiency and confusion would ensue. For this the project plan should be comprehensive.

- Focus on Contractor

Writing on the structure of an organisation Orr (2005) suggests that in complex construction projects, where there are a number of stakeholders, focus should be maintained on the contractor as they are the ones actually adding value to the project. The rest of the team should then support the contractor in the manner they best can. The structure should be an inverted pyramid rather than the normal pyramid as shown in the figure



Focus on Contractor

Source: Orr (2005)

- Trust and Partnering

The construction is beset with lack of trust leading to adversarial relationships. Smyth (2006) advises that complex projects warrant a need to forge new relationships and increase in trust. He recommends that pro-active management (emotional intelligence and relationship management) can increase the level of trust in a relationship and can lead to a 'win-win' situation or to added value for the parties. Chan et al (2004) also recommend that open communication and greater employee involvement lead to the building of trust amongst the project team.

Megaprojects are often implemented in phases and they thus present an opportunity for partnering. According to Smyth (2006) and Chan et al (2006), partnering can not only lead to the obvious benefits of collaboration (the building of long term relationship, better understanding, trust, a higher degree of innovation) but also provide added value to the client and high profitability/increased business to the contractor. This procurement route also helps overcome adversarial relationships.

4.0 Research Methodology

4.1 Background of Research

After the literature review undertaken on megaprojects in the previous chapter, the study now specifically researches the recent successful MRTS megaproject of Delhi, to understand the key factors which aided its success. The aim of this research is to bridge the gap in the understanding of megaprojects in India and hopes to propose a series of recommendations for the implementation of megaprojects in India. It also hopes to form the basis for future such studies to be undertaken. The research would not only prove beneficial for Indians, but also looks to increase the understanding of the international contractors looking to work in India.

4.2 Research Question

'What risks/issues should the client aim to mitigate/overcome in order to successfully deliver transportation megaprojects in India?'

4.3 Research Methodology

The scope of this research has been confined to the Delhi Metro Phase-I project. The focus of the research is on qualitative issues rather than on quantitative ones and hopes to generate debate on the topic of megaprojects in India amongst the research and construction faculty.

For the purpose of the research, three key personnel, one each from the client's, the project manager's and the contractor's organisation will be interviewed. It is thought that by understanding the experience and views of the three different levels of the project, a comprehensive and complete picture of the project would emerge.

The questions for the interview are based on the literature review undertaken so far and specifically originate from the theoretical framework. The interview will be taped/recorded by the author.

4.4 Profile of the Interviewees

The interviewees are:

Client

E Sreedharan, the Managing Director of the DMRC the leader and the overall client of the project. Sreedharan will be referred to as the 'client' and DMRC as the 'client's organisation' in this research.

Project Manager

S Lowry, Project Manager of the GC team. Lowry will be referred to as the 'project manager' and GC as the 'project manager's organisation' in this research.

Contractor

Y Yoshikawa, Project Leader of KSHI JV, (one of the international contractors working on the project). Yoshikawa will be referred to as the 'contractor' and KSHI JV as the 'contractor's organisation' in this research.

5.0 Analysis of the Interviews

5.1 The Interviews

The interviews conducted for the purpose of the research are presented in the appendix and this chapter analyses the issues discussed in them and also the resulting findings. The questions formulated for the interview were based on the theoretical framework presented in Chapter 3.

The interviewees were in agreement of the importance and relevance of the issues raised by the researcher and also the fact that they warrant adequate addressal in order to successfully deliver future MRTS projects in India; to ensure that not only are they delivered on time and within budget and but are also able to attract the projected ridership.

5.2 Analysis

Existence of optimism bias and strategic misrepresentation is predominant on Indian projects and therefore must be taken into account by the client and this should happen at the feasibility stage itself. The public, the politicians and the media judge the project on parameters the budgeted time and cost and if a project is not delivered as planned would result in the lowering of both the public's and the politician's confidence in the organisation. A realistic estimate and time schedule is crucial to the viability of the project as unrealistic budgets (of time and cost) lead to waste, delays and costs overruns. (Refer Appendix 1, question 1).

Adequate and assured funding and a well worked out financial plan are absolutely crucial to the success of a project. These become especially relevant in a country such as India, where there is a shortage of finances and where the funding itself is spread over large number of projects. The priorities of the Government tend to change with time thus affecting their budget allocations. In construction projects, erratic funding leads to the non-availability of the resources when required and amongst other things leads to delays. (Refer Appendix 1, question 2).

A key point to strongly come out in the interviews was that the leader/client of the project in India must understand the 'politics' of the process. Corruption, politicians and their interference plays a big (though unwelcome) part of such projects and if not appropriately handled can lead to major issues. The project leader must not only understand the system but also the needs of the politicians and those of the public as well. He should then provide them with what they seek (public support and votes) without compromising the integrity and the goals of the project. The leader must adopt a hard stance up against the corrupt and inefficient practises of the politicians. Reasoning with the politicians so that they appreciate the fact that the successful delivery of a project can increase their chances of re-election, is one possible solution. But then, the leader must ensure that the project is delivered on time and within budget. Another factor that helped ensure minimum political interference on this project was the joint and equal financial stake of the local and central government in the organisation. They thus counter-balanced each other's powers and as a result the client got a free hand in the running of the organisation. (Refer Appendix 1, question 3).

Public support and involvement is an important aspect of a project such as this and needs to be cultivated by a good public relation strategy, transparency in the organisation and genuine concern towards the public. By minimising the disturbance caused to the public (by adequate traffic management, appropriate signages, advertisements, etc) and ensuring that the project is not only delivered to the allocated budget and time, but also delivers 'value' to the public, can earn the public's trust and support. Ensuring public trust not only implies fewer interruptions and delays to the project but also the continued support of the politicians. Media is a powerful tool. The client can exploit it to achieve the public's support by using it not only to promote the project, but also by reporting the progress of the project through it. Media can act as a strong and effective link between the organisation and the public, in order to gain each other's views and feedback. (Refer Appendix 1, question 4).

Delhi Metro, first accessible project in India: Source DMRC

Risks form an integral part of any project and can lead to unexpected and severe delays and cost overruns, thus jeopardising the project. The identification of these risks is the first step in the direction of overcoming this problem. Only if they are identified can they be assessed and managed adequately. Risks should then be allocated to those who are best equipped to handle them. However, allocating risks is not enough and the risk owner needs the support of the entire team to help him manage the allocated risk. Risks then need to be constantly monitored and supervised, as even small risks can have large implications. (Refer Appendix 1, question 5).

Most of the risks on the project were adequately addressed. However a few unregulated risks were certainly taken. Though these successfully paid off in the end, to guarantee success on other projects they will need to be adequate addressal. The importance of an independent checker should not be underrated and must be included in the project to provide the necessary assurance for the viability of the design. Soil plays a major role in such projects and a contingency plan should be developed, before the start of the project, to be enforced should the soil pose a problem. Statutory bodies should play a more informative and pro-active role in these projects. They should guide these projects and provide solutions rather than looking for answers from the project team. Enough money and resources should also be set aside in the project for the implementation/installation of their requirements. (Refer Appendix 1, question 14).

Maintaining the enthusiasm of the workforce and keeping them motivated is a key challenge in a complex and long time scaled project such as this. This issue was dealt in different manners by the respondents. The Indian Public sector being renowned for its non performance and its employees, for their lack of motivation, posed a key problem to the client. He effectively managed this issue, first by empowering the employees, encouraging them to take decisions and responsibilities, and then by appreciating and recognising their efforts, all unusual practices in the Indian public services. He also led by example. His punctuality, sincerity, honesty and hand work helped keep the team motivated. The team truly believed they were doing good work under good leadership. The contractor, on the other hand, kept his team motivated by instilling a sense of healthy competition in the project and then by awarding recognition and cash incentives to the successful teams. A major source of motivation for all the teams working on the project, whether the client's, the project manager's or the contractor's, was the support and enthusiasm shown by the public and also by the media. This public applaud, an unusual event in the Indian context, provided the necessary boost for all the different teams to continuously perform well. (Refer Appendix 1, question 6).

The fact that the small size of the organisation generates better understanding amongst the project team was correlated by the findings of the interviews. It confirmed the knowledge that for complex projects such as these, it indeed is important to keep the size of the organisation down as greater interaction inculcates the feeling of trust amongst the various teams which in turn leads to a supportive and appreciative atmosphere. It also helps reduce the unnecessary layers of bureaucracy and promotes accessibility, accountability and efficiency. (Refer Appendix 1, question 7).

The Indian construction sector like the rest of the world also suffers from adversarial relationships. This can be overcome by developing a relationship based on trust and regular interaction between the parties can help promote it. Smaller organisations ensure that the decision makers are more accessible and the interaction levels are high due to fewer number involved people. (Refer Appendix 1, question 8).

Many Indian public sector projects suffer due to the fact that they are led by bureaucrats, as bureaucrats are generally adept in the administration side of the projects but have little or no understanding/experience of the technicalities of the projects. In this respect, the technical background of the client proved to be extremely beneficial to the project as he was able to grasp issues, whether problems or proposed solution, with relative ease. Another factor which helped the project was the continuity as well as the involvement of the client, as this helped maintain a consistent philosophy on the project, led to the focused achievement of the goal, lessened delays and kept the workforce motivated. (Refer Appendix 1, question 9 and 10).

Health and safety though an important and integral part of any project is often neglected on projects like these in India. It also does not have the necessary legislative backing in order for it to be enforced as health and safety guidelines on the projects. A change in the mindset of not only the workforce but also the client needs to be brought about regarding this issue. It is essential for all to understand that human life is precious and should be safe-guarded. The fact that accidents on projects do lead to delays also needs to be understood. Health and safety becomes especially important in such projects and should not only be made a pre-condition in the contract but also enforced during construction. (Refer Appendix 1, question 11).

Source: Capka, 2004

One of the key considerations in selecting the project delivery method should be the understanding of the fact that no one method of delivery fits all situations and

that the client should select the appropriate delivery system after gauging the level of complexity and uniqueness to maintain an appropriate level of control (Yakowenko, 2004). The client and the project manager were successful in this respect as after assessing the contractor's and their own team's capabilities, they decided to employ different types of contracts on different parts of the projects. The complex parts of the project were awarded as design and build to international contractors who not only had the right experience but also were of sound financial standing. The fairly straight-forward parts of the project, requiring conventional means of construction, were awarded to the local Indian contractors. This helped a faster and organised delivery of the project. Unfortunately however, enough understanding does not exist about design and build contracts in the Indian public sector. This led to conflicts as members of the client's and project manager's organisation tried to interfere in the contractor's decisions, causing delays. If megaprojects are to be developed in India, they will need different types of contracts and design and build will certainly being one of them. Awareness and education must be created about such contracts amongst the project team, before the start of the project. (Refer Appendix 1, question 12).

The vigilance unit in the Indian PSUs was created with the basic aim of rooting out corruption in order to ensure a more efficient delivery of the project. This however proved counter-productive in the Delhi Metro as employees refused to use their own judgement and insisted on following everything by the book, due to the fear of the vigilance department. The client was pro-active about this issue and circumvented the vigilance by awarding authorisation to the expatriates on the project. However this is an issue which does exist in India and a permanent solution needs to be found by the GOI in order for the efficient implementation of these projects. (Refer Appendix 1, question 13).

The construction industry in India is not very developed and therefore the necessary mechanical means of construction are not all available and therefore might need to be imported. This can lead to delays and needs to be carefully planned for. (Refer Appendix 1, question 14).

Finally, it is the contractor who provides the value in the project, who actually carries out the construction. The focus of the team should therefore be to support the contractor and facilitate his efforts in order for him to deliver the project as planned. (Refer Appendix 1, question 14).

6.0 Conclusions

6.1 Epilogue

This Chapter presents a synopsis of the literature review, the theoretical framework and the research carried out to help understand the issues and factors which influence transport megaprojects in India to come up with a series of recommendations for future such projects.

Source: Capka, 2004

India is at the crossroads of its economic boom. Never before has the economy looked so promising or shown this much growth. At its current growth rate, it is forecast to become the second largest economy in the world as early as the middle of the century (Grammaticas, 2007). However, there are factors holding this growth back. Amongst others, it is the lack of adequate and modern infrastructure. India is a country with limited resources and it thus is always not possible to find adequate funding for these projects. It therefore becomes essential that India manages its limited resources efficiently and is imperative that it invest the resources in the 'right' project- in projects which have the maximum benefit to the maximum number. It is pertinent to ensure that the commissioning of these projects is due to their value to the country rather than the ulterior motives/vested interest of various parties. On ensuring that the right project is commissioned, it

then becomes important to ensure that it is implemented in the 'right manner', that it is delivered on time, within budget and generates the expected ridership.

In order to ensure this, it is important to understand the nature of these projects. It first needs to be understood that these projects, due to their mega complexity (time scale, number of stakeholders, capital, etc involved), are unique- they are 'megaprojects'. They therefore should not simply be developed and managed as more expensive versions of normal projects. Their uniqueness and complexity demands a different approach to managing them.

Many factors need to be ensured before the start of the megaproject. The first is to ascertain whether the financial and ridership estimates are indeed realistic and feasible. The public, the politicians, the media, everyone judges a project against the initial estimates advertised and can cause loss of trust if not achieved. Inaccurate estimates not only lead to waste, cost overruns, and delays but can also destabilise policy, planning and even the government. Thus an accurate estimate becomes essential to a project. For future MRTS projects in India, estimates can be arrived at on the basis of the figures/experience of the Delhi Metro and the Kolkatta Metro.

Once the realistic budget has been arrived upon, the next step becomes to ensure assured funding for the project. This is extremely crucial and especially so in a country such as India, which suffers from a resource crunch (with many different agencies vying for those limited funds) and whose priorities also change every year. It is difficult to plan and manage a project whose funding is not regular and therefore the involvement of alternative funding agency, whether national or international, becomes imperative.

The management of the project should be goal and performance oriented i.e. the end rather than the means is important. It thus should be executed as a business plan as opposed to merely the management of the construction process. All the financial requirements, including those needed for the operation of the organisation should carefully be worked out. Only when the project has a well

worked out and viable financial plan, can it hope to attract the essential private funding. Private funding, (which has more incentives to perform), will in turn ensure that the project is delivered successfully.

Indian public sector projects are synonymous with political interference. This fact needs to be acknowledged and a strategy to overcome it needs to be formulated right at the beginning of the project itself. Alternative incentives need to be provided to the politicians to ensure that there is no interference from them, leaving the project to run in a planned and disciplined manner. Joint (central and state government) ownership will also be beneficial as not only will it help reduce corruption but could also ensure fast approvals. The politicians should also try and bring about a change in themselves. They need to understand that due to the growing levels of education in people, political corruption is not going to be tolerated anymore. Instead of trying to exploit a project, they should support it in every possible manner and its successful implementation can in turn help them win votes/elections.

These projects are also associated with internal corruption and it becomes essential for the leader of the organisation to take a hard stance against it; to send out a message loud and clear to all, that corruption will not be tolerated at any level.

Due to the growth in the levels of the education and awareness of the people and also the increasing strength of the media, people are becoming conscious about the performance of public projects. They are becoming more involved in the process and are also becoming vocal. As a result it is important to win the trust and support of the public, right from the start of the project. Stakeholder and in particular public involvement should be sought by the client - after all they are the ones who are affected the most by the project, who have to face construction on a daily basis and it is their money which is (partly) funding the project. The client should have a proper public relation strategy in place and aim to cause the least amount of disturbance to the residents of the city. Media is a powerful medium and it can be exploited in order to achieve this goal.

There exist inherent problems in the set-up of the public run organisations as well. These organisations tend to be very large; are run by bureaucratic leaders in an extremely bureaucratic manner; they are not transparent; there is a lack in the continuity of the leadership due to changing government. These are the very factors which are thought to hold back megaprojects. Megaprojects are thought to work better if its organisation is small, ensuring better interaction and therefore trust between the key members. The leader is more aware and involved in even the grass root level issues. The leaders of large organisations on the other hand are removed from the reality of the project. These organisations should also be transparent and their employees accountable. This will not only generate trust between the organisation and the public/media but within the organisation too. The background of the leader also plays an important role in the project; a technical background helps the leader understand the issues faster whereas a bureaucratic background tends to focus on the administration side of the project. Maintaining the continuity in the leadership of megaprojects is extremely important. It helps sustain a consistent philosophy on the project ensuring that the team works towards the same goal throughout the period of the project.

Keeping the workers motivated is also an issue on megaprojects. Due to the complexity of the project and the intense pressure involved, it becomes especially important to keep the enthusiasm of the workers high. Recognition, praise, empowerment, competition, cash incentives are some of the ways by which workers can be motivated and discovering what incentives provide the necessary motivation for their employees is the key to keeping them motivated. In order to maintain the productivity of their employees, the leader must support and encourage them in any manner possible and remove any obstacles affecting this. The fear of vigilance is one such issue which clients will face in megaprojects in India. The client will have to pro-actively deal with this issue to ensure the efficient delivery of their project. The GOI themselves should also recognise the vigilance issue and come up with an effective and long term solutions for it.

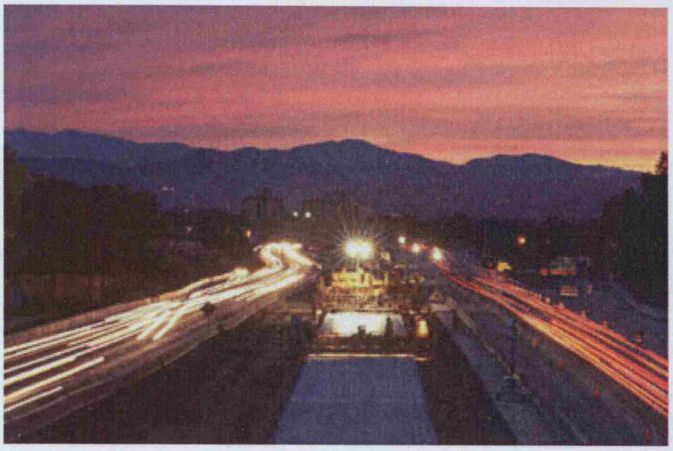
Risks are inherent in any projects. On megaprojects, these become mega-risks. Risks cause delay, confusion, waste, loss of focus and can have giant negative implications to a project. In order to successfully implement a megaproject, all the pertaining risks should first be identified and their implications assessed. They then should be allocated to those best capable of handling them. Where possible they should be mitigated. Their regular and careful monitoring is also essential for keeping a check on them. In order to implement this, the client needs to have a proper risk management strategy in place. There should also be constant support from the entire team to help mitigate any risk.

To arrive at an appropriate procurement route is often tricky. A lot of factors influence it, the availability of technology, the complexity of the project, the experience of the client's team. The path chosen on megaprojects can often be a combination of various procurement routes. Design and build is one procurement route which ensures time and cost certainty and with the added benefit of maintaining just one point of contact for the management. The Indian public sector needs to be aware about these different contracts and the client should ensure that their team is adequately educated in this respect before the start of the project.

The Indian construction industry lacks strict regulations about the health and safety of the site workers. In order for the project to proceed without any delays and without the loss of life, health and safety should be enforced on the projects. The people involved should be educated in this respect and penalised for not following it.

The role of the contractor is the most crucial in the whole project as he is the one who directly delivers value to it. This fact needs to be understood by the client who should support and facilitate the work of the contractor. It is essential for the client and the contractor to build trust. A possible route forward for megaprojects could be 'partnering' between the client and the contractor. Standardisation, cost and time efficiency, better understanding would be just some of the benefits of this

partnership. The GOI will however need to change its procurement regulations in order to facilitate this.



Source: Capka, 2004

Finally, as Capka (2004a) advises on megaprojects, 'leaders and management team must do more than manage projects; they must manage a public journey'. These projects are unique, they are complex, high budgeted, high profiled and last long periods. They must synchronise diverse perspectives, opinions, and aspirations and deliver a project according to the 'bigger picture'. Many issues which are not apparent in the planning process become visible during implementation. However, a successful project overcomes all these issues and leaves behind a sense of public pride and accomplishment. On completion, the public should be left with the feeling that the project was indeed worthwhile. It should have earned the complete trust and support of the public.

6.2 Recommendations to the Client

Recommendations:

1. Do not believe the figures provided by the planners/promoters of the project
2. Assess the feasibility- do not go ahead if projects appears unfeasible
3. Ridership figures should be based on an Indian model
4. Ensure assured funding and a comprehensive financial plan

5. Manage the issue of political interference
6. Have a transparent organisation
7. Assess the risk, allocate the risk, mitigate the risk, monitor the risk
8. Ensure the technical background of the leader
9. Lead by example
10. Motivate the team
11. Educate the team
12. Allow scope for innovation
13. Manage public trust and have a strong public relation strategy
14. Exploit the potential of the media
15. Remember- vigilance is also a risk

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Appendix 1

Questions posed to the interviewees:

1. Do you think that optimism bias and strategic misrepresentation exist in India? If yes, what are the problems associated with it? In your opinion, how can they be overcome?
2. What according to you is the role of adequate funding and a worked out financial plan in a project like the Delhi Metro?
3. Was there any interference from the external bodies? If yes, how was it overcome?
4. Do you think that the public played an important role in the delivery of the Delhi Metro? What was the strategy employed to manage them?
5. Were the risks adequately assessed and managed on the project?
6. What means did you employ to keep your workforce motivated?
7. What role did the size of the organization play in decision making?
8. Did you encounter any adversarial atmosphere/relationship during the course of the contract and how did you overcome it?
9. What role does the involvement and background of the client play in a project?
10. Does continuity of the management/leader play any role in the delivery of a project?
11. What were the problems that you faced while enforcing health and safety standards on the project?
12. What is the procurement route best suited for building Metro rail services in India?
13. How were the issues of corruption and vigilance handled on the project?
14. Do you have any other comments to make regarding the execution of the project?

1. Do you think that optimism bias and strategic misrepresentation exist in India? If yes, what are the problems associated with it? In your opinion, how can they be overcome?

Client

The Client agreed with the fact that optimism bias and strategic misrepresentation do exist in India and it also existed for the project. The initial budget proposed for the project was an unrealistic figure and he managed to revise it to a feasible figure, when the routes were altered.

Ridership was another issue. According to the initial project report, the daily ridership for phase-I for the year 2011 was 2.3 million, which his team thought to be optimistic and therefore revised it to 1.8 million. When GC became involved, they further lowered this figure to 1.15 million. At present, the daily ridership is only 0.6 million. Client has attributed this shortcoming in figures to the lack of appropriate survey models based on the Indian cities (European models were used for the projections) and also on strategic misrepresentation. DMRC is involved in the planning of the other phases of the Metro and also in feasibility studies for metros in other cities in India and they are projecting ridership figures taking the above into account.

Client added that success of the project is measured against the cost and time schedules, both by the public and by the politicians. In case there is a shortfall in the budget, valuable time is wasted in going back to the funding agency for approval of the increase in the budget. A country like India (with limited resources) cannot afford this.

Project Manager

According to the project manager, they were not involved in the project at the feasibility stage and is therefore not aware if the budget was realistic or not. They however did revise the ridership figures based on their experience in other parts of the world.

Contractor

The contractor was not involved in the feasibility stage.

2. What according to you is the role of adequate funding and a worked out financial plan in a project like the Delhi Metro?

Client

According to the client, assured funding is absolutely critical for the timely delivery of a project in India. This is due to the shortage of resources in the government and also as the priority of the government changes every year and therefore the project might not get regular funding.

Equal financial stake of both the central government of India and government of Delhi ensured that they counter-balanced each other implying that the DMRC could function independently without interference from either. The financial stake of both implied both had an incentive in faster approval process.

Project Manager

Adequate and assured funding implied that project had proper resources to be complete the project and it would not be left in the lurch due to changed government priorities.

Though the funding received from JBIC was in the form of a loan, it ensured that the international project management consortia were added to the project, which in turn ensured a type of an independent check or control over the project.

Contractor

Adequate and assured funding implied that the contractor would be able to receive all his payments on time.

3. **Was there any interference from the external bodies? If yes, how was it overcome?**

Client

According to Client, the public sector faces immense interference from the Indian politicians. They are extremely corrupt and are trying to source money and power from these organizations. They try and milk these organizations dry. Politicians also try and infuse the organizations with 'their' own people so as to be able to maintain control over them. These (politician's) people are typically non-performing and corrupt themselves.

He thus decided to take a strong stand against the politicians and would not allow any interference from them. In order to implement this strategy he made the entire finance transparent so that paying out to the politicians would not be possible without it becoming public knowledge. He also did not include any politician's person into his organization and personally interviewed the top and the middle management.

He maintained a zero- tolerance towards corruption within his organization and initially fired a few corrupt staff from his team to drive this point home. His existing image of being a sincere and honest officer also set an example to the staff.

Project Manager

The client managed the external bodies well and GC did not face any interference from them.

Contractor

No interference was faced by the contractor.

4. Do you think that the public played an important role in the delivery of the Delhi Metro? What was the strategy employed to manage them?

Client

The support of the public is crucial to any project and this fact was understood on the project. Public was kept positively involved by the effective use of media. They were regularly kept informed of the progress by regular updates in newspapers. Client gave importance to the media by granting them interviews when they wanted, and allowed them access to the rest of the project/ team, etc. He had a strong Public Relation Department who helped create and maintain the image and support for the organisation.

The welfare of the public was always given importance (a rare feature in India) and to see that the public of Delhi was not inconvenienced or inconvenienced in the least possible manner. Client insisted that officials visit and monitor any adverse reactions to the public's homes, etc. Management of pedestrians and traffic, diversions, adequate signages, attention to cleanliness (tyres of the vehicles exiting the sites were washed in order not to dirty the roads) etc were included in the contracts, and were strictly followed even in the most dense parts, ensuring the least amount of disturbance/inconvenience to the residents of Delhi. Public were consulted and kept involved. Their suggestions were taken into account and implemented in order to cause fewer disturbances to them. Plus it is the first disable free access system in India.

Public trust was sought in the above manner and the timely deliveries of each section of the project helped not only maintain it but promote it.

Project Manager

According to the project manager, the client handled the public and the public relations well and therefore the public did not pose any risk to the project.

Contractor

According to contractor, the client handled the public and the public relations well. The contractor therefore did not have to face many problems in situations which would otherwise have been very contentious (demolishing buildings, front lawns, etc for the facilitation of the works). The public was understanding and supportive.

5. Were the risks adequately assessed and managed in the project?

Client

The client said that the risks were identified and assessed adequately. They were either tried to be mitigated or transferred to those (ie the contractor) capable of handling them.

Project Manager

The project manager suggested that there was a continuous appraisal of risks. These were identified and presented to the client in fortnightly meetings. Solutions to mitigate them were then found for them.

They also supported the contractor in managing the risks for seeking the necessary approvals from the statutory bodies.

Contractor

The contractor said that they continuously assessed the situations and identified the potential risks and allocated them to the concerning individuals and monitored their progress. Though the approval seeking from external bodies was under the contractor's purview, the client and the project managers always supported them in any manner they could.

6. What means did you employ to keep your workforce motivated?

Client

The client motivated his team by empowering them and giving them recognition. Majority of the employees came from such organizations where their efforts were never recognized, their career was never influenced by their performance. Thus to empower these people and allow them to take decisions and then to recognize them was a great source of motivation for them. Apart from this, they were being recognized and applauded by the public and the media which greatly helped their spirit.

Another source of motivation for the team was the leader- Sreedharan himself. Always punctual, honest, hard working, understanding, he actively led by example.

Project Manager

The project manager believed that the fact that the project was going as per schedule and was delivering to time and budget coupled with the recognition from the public and media helped keep the team motivated. The kind of enthusiasm and support that the project generated was rarely seen on Indian public projects which provided the boost to the employees.

Contractor

Motivation amongst the workforce was sought by giving them due recognition and incentives by the contractor. He first divided the project team into different sections, and set targets for them. A sense of healthy competition was developed with various work sections competing against each other to complete their targets on time and thus to gain recognition and win awards. He not only awarded people who performed well (often offering them cash incentives) but different work sections including their support staff as well, that helped the sections to work as a team.

7. What role did the size of the organization play in decision making?

Client

The client said that he was well aware of the benefits of a small and a 'flat' organisation. According to him in a large organisation, the top management gets removed from the real issues of the project. He ensured that DMRC was a small organisation and maintained his accessibility to everyone and therefore the decisions could be taken faster.

Project Manager

The small size of the project manager's and the client's organisation meant that there was more interaction between the people involved and which helped better understanding and trust-building between the two and therefore were able to work as one team. Decision making became an easier and faster task.

Contractor

The small size of the client's organisation meant they were able to be really involved and have daily meetings with them; they were able to build trust and make faster decisions.

8. Did you encounter any adversarial atmosphere/relationship during the course of the contract and how did you overcome it?

Client

The client said that there was a certain lack of trust initially but it did develop once they started to interact together, virtually on a daily basis and were able to understand each other's priorities and thought process. As a result he was able to pass on certain responsibilities to the project managers. Also, DMRC's focus was on facilitating the work of the contractor because they understood that if the contractor has any problems, it is the project which suffers the most.

Project Manager

According to the project manager, being a small organisation they were forced to interact with the client daily which meant that the trust got established between the two quite quickly, thereafter they were able to work as one team. This helped the project in minimising client-surprise and thus quick turn around of decisions.

Contractor

Initially there was a lack of trust between the client and the contractor due to the client's misgivings regarding the contractor's capability of working in Indian conditions. Once the contractor was able to prove his capabilities due to his preferred mode of performance (as opposed to the client's), the client started respecting the contractor's judgement and the contractor was able to deliver beyond the client's expectations.

9. What role does the involvement and background of the client play in a project?

Client

According to the client his intense involvement in the project helped motivate the team and also brought across his seriousness as well as approachability and made the team work harder. He regularly visited the site to touch base with the team at the grass root level and allowed the contractors to come forth with any issues they had difficulty resolving with his team.

His technical background helped him grasp issues faster and suggest solutions with more confidence. The client therefore advised that the bureaucrats should not be leaders of such projects as they are more experience in the administration side of the project rather than their executions. They simply do not understand the intricacies of the project and only a technocrat can fully appreciate a complex project such as this.

Project Manager

The technical background of the client meant that the issues could easily be put across to him. The client's involvement implied faster decisions for them.

Contractor

The client's involvement suggested that the leader, though an important man was readily accessible to all and therefore concerns could be shared with him.

10. Did the continuity of the management/leader play any role in the delivery of a project?

Client

The client said that his continuity in the project was extremely beneficial to the project as it helped maintain the same ideology and people worked to the same goals throughout the project. A change in the leader would have meant precious time lost in the project.

Project Manager

According to the project manager, the continuity ensured that time was not lost and the understanding and trust established was maintained throughout the project. Time would have been wasted in establishing new relationships, had there been a change in management/leader.

Contractor

The continuity in leader helped maintain the focus on the goals and as per the work culture which had been cultivated in the project. A new leader would have meant a change in all this and which would have meant loss of time.

11. What were the problems that you faced while enforcing health and safety standards on the project?

Client

The attitude of the Indian construction industry is very lax in respect to the health and safety issues. The project team needed to be educated regarding it. This also helped promote a sense of trust amongst the public that the organisation cares about its workers.

Project Manager

This was indeed difficult as the whole mindset, including that of the client organisation needed to be changed. Initially, even the clients would visit the site without the appropriate PPE. But gradually with time they were able to bring about the change in the whole project team.

Contractor

According to the contractor, the outlook of the sub-contractors needed to be changed. This was brought about by explanations of the benefits of following the health and safety guidelines on the site and then later by financially penalising the sub-contractors and workers to follow safety procedures. The mindset of the client also needed to be changed- apart from the obvious benefits, following proper safety procedures sets an example for the construction workers and is in the end in the interest of the programme.

12. What were the issues involved with the procurement route followed on the project?

Client

According to the client, they split the project into different contracts according to the strengths and weaknesses of their organisation and the project manager's organisation and also according to the experience and capabilities of the Indian contractors and designers. The above ground section of the metro, which was not complex, was carried out by Indian contractors and designers as per the traditional contracts. The underground section and the system-wide contracts (signalling, telecommunications, automated fare collection, etc), for which the expertise did not exist in India, were awarded to the international contractors in a 'design and build' contract to ensure cost and time certainty.

Project Manager

The project manager commented that the fairly straight-forward and simple works were awarded to the local contractors by traditional means whereas the complex projects were awarded to international, experienced and financially sound contractors by design and build contracts. He also added that as the local staff of the client's and the project management organisation were not experienced in handling design and build contracts they therefore did not allow the contractors enough freedom to utilise their expertise in proposing design alternatives which were cheaper, faster yet which satisfied the client's requirements. This led to conflicts resulting in delays.

Contractor

The local staff of the client's and the project manager's organisation were not adequately educated and experienced about design and build contracts and therefore did not understand the process leading to delays.

13. How were the issues of corruption and vigilance handled on the project?

Client

Once the vigilance issue appeared and started holding up the work, the Client leader took the responsibility of signing off the major payments and therefore the rest of the staff could turn around the approval process much faster without the fear of vigilance.

Project Manager

On discovering the vigilance issue was causing cash flow restrictions on the contractor and was leading to delays to the project, the foreign consultants of the GC, whose acts were not being monitored by the vigilance department, were authorised by the client to sign off the mile-stone certificates which enabled the client to pay the contractors.

Contractor

The vigilance issue caused a lot of delay to the project as their payments were not authorised in a timely manner leading to major cash flow problems. However, this issue was resolved by the client who authorised the foreigners in the GC to approve payments.

This problem warrants a long term solution.

14. Do you have any other comments to make regarding the execution of the project?

Client

The client suggested that the focus should be on the contractor/designer and his needs so that he can deliver the project to your deadlines. The role of the client/project manager should be facilitating the contractor's works.

The grip of the IAS needs to be broken from such projects. The technocrats should get more freedom to run the organisation in a manner which provides value to the Indian taxpayer.

Project Manager

According to the project manager, luck also played a role in the success of the project. A lot of risks taken paid off but the situation might have been different if they hadn't. Due to the lack of budget, they didn't hire an independent checker, a critical part of such a project; the soil conditions were very good in Delhi (in his experience these always led to delays on projects) and therefore did not result in delays; the statutory organisations (fire, police, etc) in Delhi had no previous experience of such projects and therefore did not enforce any requirements and rather looked to the DMRC/GC to guide them on such matters. Also the citizens of Delhi did not have any prior experience of a Metro to compare the Delhi Metro Phase-I with.

Contractor

The lack of the availability of specialised mechanical equipment for underground construction in India, forced them to import these, which led to a lot of delay.